REMARKS

Applicants request favorable reconsideration and allowance of the subject application in view of the preceding amendments and the following remarks.

Claims 25 through 52 are now presented for examination. Claims 49 -52 have been cancelled without prejudice or disclaimer of subject matter. Claims 25, 30, 32, 37 and 44 have been amended to define still more clearly what Applicants regard as their invention, in terms which distinguish over the art of record. Claims 25 and 37are the only independent claims.

Claims 25-48 have been rejected under 35 U.S.C. § 103(a) as unpatentable over U.S. Patent 4,475,223 (Taniguchi et al.) in view of U.S. Patent 5,530,518 (Ushida et al.) and further in view of U.S. Patent 6,020,950 (Shiraishi et al.) and further in view of U.S. Patent 5,142,148 (Sato). Claims 34, 35, 46 and 47 have been rejected under 35 U.S.C. § 103(a) as unpatentable over Taniguchi in view of Ushida et al. and further in view of Shiraishi et al. and further in view of Sato and further in view of U.S. Patent 5,894,341 (Nishi et al.). With regard to the claims as currently amended, these rejections are respectfully traversed.

Independent Claim 25 as currently amended is directed to exposure apparatus that performs exposure using EUV or X-rays in a vacuum. In the apparatus, a projection optical system projects a pattern formed on a first object onto a second object by using the EUV or X-rays passing through the vacuum. The projection optical system has a diaphragm irradiated by the EUV or X-rays which is scattered by the pattern and a cooling device which cools the diaphragm. The diaphragm is not irradiated by the EUV or X-rays when no pattern is formed on the first object.

Independent Claim 37 as currently amended is directed to a device manufacturing method in which exposure is performed in a vacuum of a pattern which is formed on a reticle

onto a wafer by projecting EUV or X-rays through the vacuum in which a diaphragm of a projection optical system is irradiated by the EUV or X-rays scattered by the pattern. The diaphragm is cooled and a device is manufactured from the wafer. The diaphragm is not irradiated by the EUV or X-rays when no pattern is formed on the first object.

In Applicants' view, Taniguchi et al. discloses an X ray exposure process and system for transferring a mask pattern onto a wafer with use of X rays in which heights on the mask at many points are measured on a light interference band basis by a mask-height measuring device of non-contact measurement type at an X ray exposure position. The mask is mounted on a chamber which is filled with a He gas and or the like to prevent attenuation of an X ray source. Heights on the wafer at many points are measured at a wafer-height measuring position different from said exposure position, and according to the measured results, the wafer is finely moved upwardly or downwardly (that is, deformed) individually independently by means of a chuck which sucks and holds the wafer at many points thereon so that, a gap between the mask and wafer is adjusted to a desired level.

In Applicants' opinion, Ushida et al. discloses a projection exposure apparatus that includes an illuminating optical device for illuminating a projection negative and a projection optical device that projection-exposes a projection negative illuminated by the illumination optical device onto a substrate and Shiraishi et al. '950 discloses an exposure method and projection exposure apparatus in which a light shielding plate has a set of fixed peripheral openings with a fluid path through the center of the plate.

Sato, in Applicants' view, discloses a field emission scanning electron microscope in which an aperture plate is disposed in a high-vacuum region between an accelerating electrode and a condenser lens. The probe current is controlled by controlling an extracting voltage

applied to an extracting electrode. An aperture plate 4 that controls an electron beam diameter is protected against contamination due to electron beam illumination by placing it under a high vacuum as an alternative to a heating arrangement for cleaning the aperture plate.

In accordance with the invention defined in independent Claims 25 and 37, a diaphragm is irradiated by EUV or X-rays scattered by a pattern formed on a first object and projected by a projection optical system in a vacuum. The diaphragm is not irradiated by the EUV or X-rays when no pattern is formed on the first object. This feature of Claims 25 and 37 is disclosed at least at lines 16 through 23 of page 8 in the specification. No new matter is believed to have been added.

Taniguchi et al. may disclose exposure apparatus that performs exposure using X-rays in which a projection optical system projects a pattern onto a substrate. There is, however, no suggestion in Taniguchi et al. of a projection optical system in a vacuum that has a diaphragm irradiated by EUV or X-rays scattered by a pattern and a cooling device that cools the diaphragm.

Sato discloses a field emission scanning electron microscope arrangement which has an aperture plate 4 that is irradiated by an electron beam prior to entering a beam projecting region (elements 6, 7 and 8) but is devoid of any suggestion of a projection optical system in a vacuum having a diaphragm irradiated by EUV or X-rays scattered by a pattern formed on a first object and cooled by a cooling device. Neither of these references or any combination thereof in any manner suggests the feature of the diaphragm not being irradiated by the EUV or X-rays when no pattern is formed on the first object.

Ushida et al. may disclose a projection exposure apparatus in which a projection optical system that projects a pattern formed on a reticle onto a substrate has an annular

secondary light source to set the numerical aperture of the projection optical system. The annular secondary light source, however, has an inner annular diameter and an outer annular diameter which receive light without a reticle pattern. As a result, the Ushida et al. arrangement fails to teach or suggest the feature of Claims 25 and 37 of of a projection optical system diaphragm that is irradiated by EUV or X-rays scattered by a pattern on a first object not being irradiated by the EUV or X-rays when no pattern is formed on the first object.

Shiraishi teaches a projection optical system that has a cooling member. In Shiraishi, light from a reticle passes through a light shielding plate of a projection optical system having a central portion FLc and an annular light shielding portion FLr. Accordingly, the light shield is irradiated when no pattern is formed on the reticle. There is, however, no teaching or suggestion in Shiraishi of a projection optical system in a vacuum having a diaphragm irradiated by EUV or X-rays scattered by a pattern formed on a first object or of the diaphragm not being irradiated by the EUV or X-rays when no pattern is formed on the first object as in Claims 25 and 37.

With regard to the cited combination, Taniguchi et al. only teaches exposure apparatus that performs exposure using X-rays in which a projection optical system projects a pattern onto a substrate but is devoid of any disclosure of a diaphragm in the projection optical system. Sato only discloses a field emission scanning electron microscope arrangement which has an aperture plate 4 that is irradiated by an electron beam prior to being projected onto a substrate but fails to suggest a projection optical system in a vacuum having a diaphragm irradiated by EUV or X-rays scattered by a pattern formed on a first object and cooled by a cooling device wherein the diaphragm not being irradiated by the EUV or X-rays when no pattern is formed on the first object as in Claims 25 and 37.

Ushida et al. only discloses a projection exposure apparatus in which a projection optical system that projects a pattern formed on a reticle onto a substrate has an annular secondary light source to set the numerical aperture of the projection optical system which annular secondary light source fails to suggest the feature of Claims 25 and 37 of a diaphragm not being irradiated by the EUV or X-rays when no pattern is formed on the first object. Shiraishi is limited to teaching a projection optical system with a cooling member in which. light from a reticle passes through a light shielding plate of a projection optical system having a central portion FLc and an annular light shielding portion FLr which arrangement is directed away from the feature of a diaphragm irradiated by EUV or X-rays scattered by a pattern formed on a first object and not being irradiated by the EUV or X-rays when no pattern is formed.

None of the cited references in any manner suggests the feature of a diaphragm not being irradiated by EUV or X-rays when no pattern is formed on the first object. It is therefore not seen that the addition of Sato's electron beam aperture to Shiraishi's shield plate to Ushida et al.'s annular secondary light source to Taniguchi et al.'s projection optical system could possible suggest the feature of Claims 25 and 37 of a projection optical system in a vacuum having a diaphragm irradiated by EUV or X-rays scattered by a pattern formed on a first object and cooled by a cooling device wherein the diaphragm is not irradiated by the EUV or X-rays when no pattern is formed on the first object. It is therefore believed that Claims 25 and 37 as currently amended are completely distinguished from any combination of Taniguchi et al., Ushida et al., Shiraishi and Sato and are allowable.

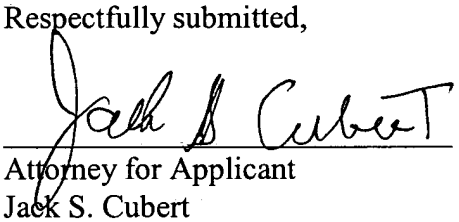
For the reasons noted above, Applicant submits that the present invention, as recited in independent claims 25 and 37, is patentably defined over the cited art.

Dependent claims 26-36 and 38-48 also should be deemed allowable, in their own right, for defining other patentable features of the present invention in addition to those recited in their respective independent claims. Further individual consideration of these dependent claims is requested.

Applicant further submits that the instant application is in condition for allowance. Favorable reconsideration, withdrawal of the rejections set forth in the above-noted Office Action and an early Notice of Allowance are requested.

Applicant's attorney, Steven E. Warner, may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should be directed to our address listed below.

Respectfully submitted,



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